raised and the Government will collect the information on it. The Home Minister will come back to the House and, if possible, it will be laid today evening, or, on Monday. *(Interruptions)*

SHRI ARJUN SINGH (Madhya Pradesh): Sir, Mr. Nilotpal Basu said *(Interruptions)*....

MR. CHAIRMAN: I have not said anything. I said, whatever is not according to the rules will be deleted. He has said something, I will see to it that whatever is according to the rules will remain. Now, Question No. 181, Mr. Duraisamy.

ORAL ANSWERS TO QUESTIONS

Proposal for Human Genome Sequencing by CCMB, Hyderabad

*181. SHRI V.P. DURAISAMY: Will the Minister of SCIENCE AND TECHNOLOGY be pleased to state:

(a) whether it is a fact that former director of Centre of Cellular and Molecular Biology, Hyderabad, had submitted to the Department of Biotechnology, in 1989, the human genome sequencing project by our scientists;

(b) whether it is a also a fact that the Department has confined the proposal to the cold storage; and

(c) if so, the reasons for not approving the proposal in 1989?

THE MINISTER OF SCIENCE AND TECHNOLOGY (DR. MURLI MANOHAR JOSHI) (a) In April 1989, a letter was received by the Government from the former Director of Centre for Cellular and Molecular Biology, Hyderabad regarding the Human Genome Sequencing Programme by national scientists. This also indicated a tentative cost of Rs. 300 crores for 15 years;

(b) and (c) No, Sir. The Department of Biotechnology with large number of experts from the country, analysed the position. It was decided that it would be worthwhile to take up an Indian programme on genome sequencing that is more relevant to country's specific needs and would be economically feasible. The Expert Committee accordingly recommended to initiate development technologies for identifying known mutations in specific genetic disorders in the Indian

population and initiating studies on human genome diversity. Programmes presently are under implementation in these areas and the country is well poised in infrastructure and trained human resource to take on the work in functional genomics, one of the most important component of the human genomics and related areas.

SHRI V.P. DURAISAMY: Mr. Chairman, Sir, the hon. Minister's written reply is not very comprehensive. The recent announcement of the virtual completion of the human genome sequency project is widely regarded as one of the most important advances in the history of science. In 1988, when the U.S. had decided to invest in this project, which subsequently became an international project, with the participation of even countries such as China and Japan, but not India, the then Director of the Centre for Cellular and Molecular Biology, Hyderabad, Dr. Bhargava, wrote a letter to the then Prime Minister, Shri Rajiv Gandhi, suggesting that India should also invest in the human genome project. He has stated that India could do it at a much lower cost than the U.S., that is, in Rs. 300 crores, which would mean Rs. 200 crores per annum. As usual, the Prime Minister's Office referred his letter to the Department of Biotechnology, who have shelved it on flimsy grounds. Even though Dr. Bhargava played a vital role in the setting up of the Biotechnology Department and was a member of its high powered Scientific Advisory Committee for many years, why did not the Department of the Biotechnology acknowledge his letter? Why did not the Biotechnology Department communicate the reasons for it being shelved?

DR. MURLI MANOHAR JOSHI: Sir, in order to keep the record straight, let me trace the history of this whole episode. The hon. Member has referred to his great project about which a recent announcement has been made by the US President and the UK Prime Minister about the advances in human genome research and the number of diseases and hereditary defects which could cured as a result of scientific investigations in this field. It has been pointed out **the** a letter was written by the former Director to the then Prime Minister. Let me say that this letter which the hon. Member has referred to was written by Prof. Bhargava to the then Prime Minister of India sometime in April, 1989. This letter was not written to the

Department of Biotechnology. It was addressed to the Prime Minister. The Prime Minister's Office did not send any reference to the Department of Biotechnology till 19th February, 1990, and that was also, perhaps, as a result of a letter from Prof. Bhargava to the then Minister of Science and Technology, Prof. Menon, enclosing a copy of his earlier letter, along with Prof. Menon's letter. In that he had specifically mentioned to prevent a meeting of the scientists in the genetic field which was being held with Prof. Canter who was the Director of the Human Genome Centre at Lawrence Berkley Laboratory in USA. The fact of the case is like this. In 1986, Dr. Watson in the USA announced this programme, and in 1988, this Human Genome Organisation was set up to coordinate international efforts. Now, at the 1986 meeting, the only scientist who was invited from India was Dr. Sharat Chandra; he was the only Indian and he is, perhaps, one of the finest genetic researchers in this country. Prof. Bhargava was not invited to this meeting. When Dr. Sharat Chandra came back, he discussed this project with the Secretary of Biotechnology Department. The Department was established only in 1986. Immediately, the Department started discussions with various scientists in the country and as a result of that, they also tried to find out what projects can be undertaken in India and how this project can benefit the people of India. As a result of this, a meeting was held on February 14th 1990. The USA also did not start the project in 1986 or 1988. The launched the project in 1990 and projected a cost of three billion dollars for 15 years. The Indian scientists assembled on 14th February, 1990. Prof. Cantor was invited to this. They discussed this and after that, they decided—the minutes say—that India should not and cannot join that sort of a costly project. They decided that India should take India-specific projects as research project. Now we see we have four or five important activities going on under this project. So, there has been no shelving of this project or putting it in cold storage. Indian scientists are very serious. They have established 52 centres of bio-informatics and four genomic data centres where they are collecting the data. Ten thousand scientists are working in off-loading data and using this data. They are studying genetic disorders, human genome diversity projects, functional genomics. This is most important because what we want is this. We want that this research should lead to the direct

benefit to the common Indian masses. For example, Malaria is a very virulent disease. Now, we must discover vaccines of Malaria. We want to do this research here. Prof. Bhargava had pointed out that we should undertake this project for two reasons; firstly, it will be much cheaper in India, secondly, the data collected by the USA will not be available to Indians. On both counts, he was incorrect. The very first announcement and the recent announcement of President Clinton—I read out the extracts of the last few lines—says, "The Human Genome Project, which completed its version of the working draft two years ahead of the schedule and under Budget, will continue its long standing practice of making all of its sequential data available to public and privately funded researchers world-wide, at non cost." So, his apprehension that this will not be available to Indians was ill founded. Even in earlier discussion, Dr. Watson had said that this data would be available in the public domain.

The third point is about the cost. Number one: He had not mentioned about any Project. He had not given any detailed project report. He had only said that, perhaps, India could invest for 15 years a sum of Rs. 150—300 crores. May I most humbly inform the House that this was totally a gross underestimation of the cost. The cost, at that time was probably Rs. 80 lakhs per machine. Sir, America had put up some 300 machines and, considering the size of human material available here, we have to put up about 1000 machines. So, there was no question of spending Rs. 150—300 crores. It would have been somewhere around Rs. 700—800 crores for the machines alone. Then, chemicals and other usables are very costly. They have to be imported. The only component which is cheaper here is the salary of the scientists and such other costs. So, the Indian scientists fully deliberated.

Another part of the issue was this. Dr. Bhargava was invited to attend the meeting on 14th February, 1990, but he refused to attend the meeting. He was a Member of several Committees and, wherever the subject was discussed, he participated in some of them. But, I am surprised, after having dealt with all these questions by the researchers of this country, the great scientists of this country, why this question is now being raised when the Indian Biotechnology and Genetic Research is moving forward and has done a very useful

work? Therefore, the information given to the hon. Member is incomplete and, I think, the record must be set right. There is no dereliction of duty on the part of the Department of Biotechnology. It is fully taking cognisance of this Project. It is active on this Project and is making useful contribution towards this Project.

SHRI V.P. DURAISAMY: The Minister has given a wrong reply. Anyway, we have missed the bus in regard to sequencing of the human genome. Dr. Bhargava suggested last year to the D.G. of the I.C.M.R. that a committee be constituted to analyse the sequences of the genomes of various organisms. It was widely recognised even a few years ago that the major experiment in biology in this century is going to the area of application of genome analysis in medical and health care, agriculture and sociology. Human genome sequence would also result in significant changes in our future life-styles.

The Committee was constituted and it has held three meetings. But, surprisingly, the minutes of this meeting, with specific recommendations, were not circulated among the Members. May I know from the hon. Minister whether this Committee had submitted any proposal to the Secretary, Department of Biotechnology? If yes; why have they not been approved? I understand, the Secretary, Department of Biotechnology, had raised some frivolous objections in spite of the tremendous support from other Members. Does the hon. Minister know about it? If so, what measures the Minister would take to give clearance to this proposal?

Finally, I suggest to the Minister that analysis of genomes, including human genome, should be taken up as a major national mission under the Chairmanship of Dr. Abdul Kalam, with the I.C.M.R. as the nodal agency and with financial contributions from other related departments. As has been estimated, initially, the project would cost Rs. 50 crores, over a period of five years ...*(Interruptions)*... It is a technical question ...*(Interruptions)*... Please sit down ...*(Interruptions)*... I also suggest that the progress of the work on the project should be monitored by a high-powered committee by involving some of the world's best known and socially committed scientists whose interests transcend national boundaries and who have been extremely sympathetic to India. Will the Minister

accept this suggestion and bring India on the map of human genome project?

DR. MURLI MANOHAR JOSHI*. Sir, India is already on the map of international research. Some of our labs are doing very good work. For example, India has 3,496 entries, as seen from the National Centre for Biotechnological Information, NIH, USA. Of this, sixty per cent of Indian origin, that is 2798 is from India. It means, India must have contributed at least 1500 kb. The contribution of labs which are working on it is, CCMB 59 kb, Indian Institute of Science 227 kb, South Campus of Delhi University 67 kb, JNU 296 kb, and NH 65 kb. So, you win that all of them are active. Some of our vaccines, some of our work, which has been done by our scientists, have been widely recognised. I need not go into those details. So far as this Committee which the ICMR has decided to constitute, or it is recommending, is concerned, we have not received any recommendations. Perhaps those recommendations are not final. Moreover, the ICMR is not under my Ministry. As and when they send a report, we shall consider it on merits. There is no proposal to the Department of Biotechnology from anybody. Let me also make one point dear that I have gone through the scientific work of this former Director, who is writing and saying so many things about genetics. Out of all this papers, I don't find even a tingle paper on genetics or on human genome. He is a biochemist. The only paper which I have seen, out of this list, does not deal with genetics. *(Interruptions)*

SHRI NILOTPAL BASU: Sir, he is going out of the way. *(Interruptions)*

DR. MURLI MANOHAR JOSHI: The question is, therefore, that recommendations or suggestions...(*Interruptions)*

DR. MANMOHAN SINGH: He is a very distinguished scientist. *(Interruptions).* He could present this to the House...*(Interruptions)*

DR. MURLI MANOHAR JOSHI: His name is being constantly referred to as one of the top-most international scientists in genetics, *(Interruptions)* He has referred to Dr. Bhargava's name, *(Interruptions)*

SHRI PRANAB MUKHERJEE: Pleased restrain yourself from making.. .*(Interruptions)*....

DR. MURLI MANOHAR JOSHI: The question, therefore, is...*(Interuptions)*... Therefore, we win examine...*{Interuptions)*... The question is, whenever there is a recommendation, we will consider it on merits. We are very seriously interested in putting India on the international map in all fields of biotechnological research.

DR. MANMOHAN SINGH: Mr. Chairman, Sir, there is no doubt that the breakthrough in sequencing of human genome is a major development which has profound implications and implications for our life-style, for disease control, and ever for development of agriculture. It has been a collaborative effort in which, I believe, apart from the scientists from advanced countries, the Chinese have also played a very important role. The hon. Minister has mentioned various reasons as to why he could not participate In this collaborative project because of cost. But that is a thing of the past. I would ask the hon. Minister to let us know if the Government, would approach on this whole research and their application in a mission-oriented fashion so that India is able to derive a maximum possible advantage in various disciplines out of the researches emerging from the human genome project.

DR. MURLI MANOHAR JOSHI: Sir, the fact that China has done something in human genome research is ill-founded. The only two countries who have contributed mainly anything worthwhile are, USA and UK, and a small contribution is from France. Now we have a mission already working on genomics and one part is on rice genomics. On this part of human genomics now, as I have already indicated, we have 52 bio in formatic centres. There are four genomic centres from where we collect the data and 10,000 scientists are working to offload this data round the clock.

DR. RAJA RAMANNA: Mr. Chairman, Sir, India, unfortunately, has been- missing chances of being in the forefront of research at various stages of our history during the last 50 yean. For instance, in hardware electronics, by taking wrong decisions, we have gone back. Instead of being in the forefront, we still depend on other countries from whom we are importing IC etc This question that has been

raised is of importance, in the sense—have we missed another has with respect to the genomics project? The hon. Minister however has been good enough to tell us that the work is going on. Now, if it is a matter of purely technical value and technical importance, of the work that has been done then, it is a subject for discussion in the technical group and not be a part the hon. House here, because they would not have all the facts at their disposal. Especially, the quality of somebody's work and the papers that have been published, these are matters which should be judged by experts. I am somewhat sorry that the discussion has taken a turn in that direction. In any, case, I would recommend to this House that the genome project should be taken up with all the strength that we have, that is, with all the scientists working together in cohesion because it is a very difficult project but a very important one for the country.

DR. MURLI MANOHAR JOSHI: I entirely agree with the former Minister that in many areas, during the past several years, we could not catch up with the rest of the world, and, in certain cases, we did miss the opportunity. There may still be some cases where we may not be going as fast as we should. But let me assure the House that in the field of biotechnology we are not missing any bus. Rather, our Department, within a very short period of 14 years—it was established only in 1986—it is now on the international map. Let me assure him that with 10,000 scientists working round the clock to offload data, to study the sequencing of the chromosomes and genes and trying to use them for discovering various peptides which would be useful for curing diseases, hereditary diseases, and genetic deformations. We are also in touch with some of the Indian drug companies to use this data and to come forward with certain cures and drugs for the benefit of the people in India. So, we are not missing the bus. But certainly, we cannot compete with a country like USA. We must also realise that we have our own limitations and, within those limitations, I can assure this House that this Government will take alt necessary steps and will leave no stone unturned to put India on the international map in the field of genetic research.

DR. (SHRIMATI) JOYASREE GOSWAMI MAHANTA: Sir, I appreciate the idea of the human genome sequencing project that has

been presented by the Director, Centre for Cellular and Molecular Biology, Hyderabad. Sir, I would like to know whether the Government has thought of taking any immidiate steps which would be feasible, to enable the scientists and students to cany on with the work—with the help of this idea of a project—which will be less costly and less time-consuming. My second part Is: Is any such type of research going on in any university or research centre in our country with Government help?

DR. MURLI MANOHAR JOSHI: Sir, as I have already indicated, there are 52 centres from where we are collecting the data and we are connected with the rest of the world through satellites and other connectivities so that any data which is found anywhere in this field is available to us. We nave certain centres, very important centres, and they are working; students are working; universities are ate coating up and picking up. At I intimated to you, this is a subject which is of a very recent origin in India. Still, the JNU campus here, the South Campus and the Indian Institute of Science, all these, are working. At present, 14 Centres are doing research, with six major facilities, which are of international standard.

SHRI BRATIN SENGUPTA: Mr. Chairman, Sir, it would be excellent if the proposal suggested by Mr. Duraisamy can be implemented. But yon said that due to resource constraint, in this epoch-making breakthrough of human genome sequencing, our country is lagging behind; it is quite natural. Therefore, I would like to know; can you go in for certain better collaboration, a wider kind of a collaboration with the USA, in particular, so that the data-sharing can be quicker, the data downloading can be much better and the entire feedback can be readily obtained by us. Whatever yon have said on the floor of this House regarding the Department of Biotechnology and the Prime Minister's Office and also regarding the proposal of this particular scientist. I will not name him here—I would like to know whether this straight record, in writing, was sent back to Mm in due time or any time since 1989 from your office or from the Prime Minister's Office, to whom this letter was written. He is not an ordinary biochemist because it was the Government which had appointed him as the Director of CCMB. Do you mean

that the decision of the Government was wrong, because he was undermined on the floor of the House by none else than the Minister?

DR. MURLI MANOHAR JOSHI: Sir, it has already been referred to. I have given all the details. I think it is not necessary. This question should not have been raised. I have always been informing the House, still I say that we have a full machinery to download the data. There are 52 bioinformatic Centre; 10,000 persons are working there day and night to download the data which is available anywhere in the world. We are not lagging behind in offloading the data. Today, we are negotiating collaborations with the United States and the United Kingdom on this issue. Besides, we have also collaborations with other countries. There are certain fora where these problems are being discussed. Recently, an Indo-US forum for science and technological activities has been formed. Our scientists will also discuss as to what steps we should take in order to make rapid advances in the field of biotechnology, particularly in genetics.

DR. KARAN SINGH: Mr. Chairman, Sir, it is good that the Minister has said that this is an important breakthrough. The information is going to be available worldwide. However, I would like to have one clarification from the hon. Minister. Pure research is often available worldwide, but its application is very often patented by large pharmaceutical companies as a result of which it is not possible for the developing nations to take advantage of this. Will the hon. Minister clarify—you talked about this major breakthrough being in the interest of the masses of India—that that we will not be caught in the patent trap when the application of this major breakthrough comes about?

DR. MURLI MANOHAR JOSHI: Well, you are absolutely right. If certain countries get better results and they formulate certain better drugs, they will get it patented. That is a different issue. But on the patenting of sequences, no decision has been taken yet. There is no agreement on this. All these questions are being discussed by the National Committee on Bio Ethics. Certainly, if any drug is found, one will steal a march over others. Even in India, now we are using all these results. We have already counselled 11,000 families, on

the basis of the results available to us, for pre-natal diagnosis; in certain cases, where a serious deformation was discovered, medical advice was given. Out of these 11,000 families, 1700 families were tribal families. We are on the job, with our limited resources i.e. just Rs. 5-6 crores. We are trying to do our best and I assure you that our main aim is to apply this research to Indian problems and to Indian conditions.

SHRI KAPIL SIBAL: Sir, apropos what the hon. Minister has said, I would like to put him one question. I believe that in the United States, *some* other scientists have already applied for patenting of the sequencing. If this is a fact, I would like *to* know from the hon. Minister whether he has taken up this issue in the Indo-US Forum?

DR. MURLI MANOHAR JOSHI: Well, as for the question as to how many scientists have applied for patents, I need a separate notice. But there has been no meeting of the Indo-US Scientific Forum as yet; as soon as the meeting takes place, we will discuss all these issues.

उत्तर प्रदेश में उर्वरक परियोजनाएं

*182.**श्री मनोहर कान्त ध्यानी**: क्या रसायन और उर्वरक मंत्री यह बताने की कृपा करेंगें कि:

(क) उत्तर प्रदेश में सार्वजनिक एवं निजी क्षेत्र में स्थापित की गई उर्वरक परियोजनाओं और उनके वार्षिक उत्पादन तथा आय का अलग-अलग ब्यौरा क्या है;

(ख) क्या इन एककों में से किसी एक एकक में विदेशी निवेश किया गया है; और

(ग) गोरखपुर उर्वरक परियोजना की स्थिति क्या है?

रसायन और उर्वरक मंत्री (श्री सुरेश प्रभू): (क) से (ग) एक विवरण-पत्र सभापटल पर रख दिया गया है।

विवरण

(क) उत्तर प्रदेश में सार्वजनिक, सहकारी तथा निजी क्षेत्र में स्थापित प्रमुख यूरिया उत्पादक उर्वरक एककों के ब्यौरे, उनकी वार्षिक यूरिया उत्पादन क्षमता तथा वर्ष 1997-98 से 1999-2000 के दौरान कर पूर्व लाभ का ब्यौरा विवरण-1 में दिया गया है। (नीचे देखिए)

(ख) जी, नहीं।